

CLAIMS

1. An apparatus for releasing a jam between an inter-engaged lead screw and nut in a motor driven lead screw actuator under load, including a device for releasing the jam and a device for operating the jam release
5 device when the normal operating correlation between torque applied to the actuator by the motor and the output force of the actuator corresponding to normal unjammed operation of the actuator under load is lost.
2. Apparatus according to Claim 1, wherein the jam release device is
10 electro-mechanical and wherein the device for operating the jam release device is electrical.
3. Apparatus according to Claim 2, wherein the device for operating the jam
release device includes a torque sensor for sensing the torque applied to the actuator, a force sensor for sensing the output force of the actuator,
15 means for comparing the expected normal operating force for a given torque to the actual force of the actual measured torque, and means for actuating the jam release device if the difference between the expected force and the actual measured force is outside a predetermined threshold and for switching off drive power to the motor.
- 20 4. Apparatus according to Claim 2, wherein the device for operating the jam release device includes a torque sensor for sensing the torque applied to the actuator, a force sensor for sensing the output force of the actuator, and means for actuating the jam release drive if the sensed force is more positive than a predetermined threshold value T_1 and the sensed torque
25 is more negative than a predetermined threshold value T_3 or if the sensed force is more negative than a predetermined threshold value T_1 and the sensed torque is more positive than a predetermined threshold value T_3 , which actuating means is also operable to switch off drive power to the motor.
- 30 5. Apparatus according to Claim 2, Claim 3 or Claim 4, wherein the jam release device is an electromagnetic clutch.

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6. Apparatus according to Claim 1, wherein the jam release device and the device for operating the jam release device are mechanical and combined.
7. Apparatus according to Claim 6, wherein the said devices include two or more spaced apart parallelly opposed, cams connectable to the actuator motor in parallel to the lead screw and in drive connection to the motor, at least two spring-loaded finger detents moveably housed one in each cam to project therefrom substantially parallel to one another into the space between the opposed cams, and a peg projecting laterally from the actuator nut for location in the space between the cams to engage between and in contact with both projecting finger detents, so that with the apparatus operatively connected to the actuator and motor and with a load applied to the end of the lead screw remote from the end adjacent to the motor, drive is applied to the lead screw from the motor via the cams attached to the motor, finger detents carried by the cams, and peg attached to the nut, which peg is engaged by and between the finger detents, and the angle of the cams being such that the reaction force on the peg under drive from the motor is substantially at right angles to cam faces on the cams, such that if the actuator jams the peg displaces the respective finger detent against the spring-loading and moves out of engagement with the finger detents and cams thereby de-clutching the motor from drive contact with the nut to release the jam.
8. Apparatus according to Claim 6, wherein said devices include two or more pairs of oppositely directed spaced apart cam surfaces operatively attached to the circumferential surface of the actuator nut for engagement by spaced apart pairs of drive pegs carried on a tubular member surrounding said nut and spring-loaded in the axial direction of the actuator lead screw carrying the load and screw threadably engaging the nut, which tubular member is axially movably spring loadably mounted in an annular surrounding housing in drive contact with the drive motor so that drive is imparted to the nut from the motor via the housing, tubular member, drive pegs and cam surfaces and in the event of a jam the drive pegs are driven along and out of engagement with the

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cam surfaces with accompanying axial movement of the tubular member against the spring-loading thereby de-clutching motor drive from the nut.

9. Apparatus according to Claim 8, including the substitution in which the motor is in driving connection with the lead screw instead of with the nut,
5 and the tubular member is connected to the load instead of to the motor.
10. Apparatus according to Claim 6, wherein said devices include two or more spaced apart, parallelly opposed, cams driveably connectable to the actuator motor in parallel to the lead screw, and interconnected across the space between the cams by a frangible link extending therebetween,
10 and a peg projecting laterally from the actuator nut for location in the space between the cams in engagement with the frangible link, so that with the apparatus operatively connected to the actuator and motor and with a load applied to the end of the lead screw remote from the end adjacent to the motor, drive is applied to the lead screw from the motor
15 via the cams attached to the motor, the frangible link attached to the cams, and the engaging peg attached to the nut, which frangible link is strong enough to transmit normal torque drive to the nut via the peg but weak enough to shear, and thereby de-clutch the nut from the motor, in a jam situation to release the jam, which cams help to guide the peg as it
20 moves away from its normal operating position after the frangible link has sheared.
11. Apparatus according to any one of Claims 1 to 10, when used in an aircraft.
12. Apparatus for releasing a jam between an inter-engaged lead screw and
25 nut in a motor driven lead screw under load substantially as hereinbefore described and as illustrated in Figure 4, Figure 5, Figures 6 to 9, Figures 10 and 11, Figures 12 to 16, and Figures 17 to 19 as modified or not by Figure 3 or any one of Figures 20 to 23 of the accompanying drawings.